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ABSTRACT

This booklet provides an overview of IST (Individualized Study by Technology) programs at small, isolated rural high schools in Alaska, which use individualized microcomputer-based courses to provide a more complete curriculum. First, a general description is given of the IST program, which utilizes teachers, traditional texts, and printed materials; microcomputer-assisted/managed instruction; and audiotape cassettes. Implementation of the four courses currently taught--Alaska history, English, developmental reading, and general math--is explained, focusing on teacher supervision, use of aides, use of the microcomputer, and materials storage. Additional sections discuss the evaluation design, pilot testing, microcomputer equipment reliability, characteristics of IST teachers, teacher training, and assistance. Study results summarized include those relating to teacher attitudes, student characteristics, course completion, student attitudes and achievement, and course costs. Major conclusions drawn from the evaluation of the 1980-81 pilot testing and projections for the program's future conclude the paper. Eight tables display pilot test evaluation data. (LMM)

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INDIVIDUALIZED STUDY BY TECHNOLOGY (IST)

by



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INDIVIDUALIZED STUDY BY TECHNOLOGY (IST)

Alaska is the largest state, more than twice the size of Texas, and is also the most sparsely populated of the 50 states, averaging less than one person per square mile. Thus, Alaska faces unique problems in providing quality secondary education to its children in the many small, isolated rural communities located throughout the state. Prior to 1975 many rural Alaskan children had to attend boarding schools in the larger Alaskan cities or the lower forty-eight states in order to obtain a secondary school education. This situation was unsatisfactory to parents. Furthermore, many of these children were not able to complete their secondary education due to the homesickness and culture-shock they experienced when they left their homes and families.

In 1975 two events occurred which changed the course of Alaskan secondary education. First, the state-operated school system in Alaska was disbanded by state law, and replaced with 21 Regional Education Attendance Areas (REAAs). These REAAs received virtually 100 percent of their funding from state taxes, but each had its own locally elected board with full policy-making powers. The second event in 1975 was the settlement of a lawsuit (Hootch vs. Lind) that established the right of Alaskan children to an education through twelfth grade in their own community. As a result of these two events, rural Alaskan children would no longer have to leave their homes and families to receive a secondary school education.

Presently, about 180 small Alaskan communities have high school programs. However, about 60 of these communities have programs with 10 or fewer students, and another 95 or so have programs with fewer than 50

students. In these small communities it is not feasible to hire a large number of teachers with specialized knowledge to offer a comprehensive array of high school courses. Innovative uses of resources and creative ways to satisfy curriculum needs are essential if these communities are to provide their children with a quality secondary level education. Several approaches now being used to enhance high school instruction in Alaska are student exchanges, itinerant teachers, mobile labs, televised (or videotaped) instruction, correspondence courses, and educational student trips. Individualized Study by Technology (IST) is another such approach utilizing the microcomputer, and is the focus of this paper. Individualized courses developed in the IST program permit the small, isolated, rural schools to provide a more complete high school curriculum, and have the advantages of reducing the workloads of the teachers and allowing students to work at their own pace.



A typical rural community in Alaska

The Individualized Study by Technology (IST) program is one component of Educational Telecommunications for Alaska (ETA), a multi-year project funded by the National Institute of Education (NIE) and the Alaska Department of Education (DOE) for the purpose of developing and demonstrating educational uses of modern electronic technologies. The IST program, in particular, was initiated in response to the need to bring high quality secondary school level educational programs to Alaska's small, isolated, rural schools with limited staff and support materials. The Northwest Regional Educational Laboratory (NWREL) in Portland, Oregon was the design and implementation contractor for the project.

During the 1979-1980 school year two NWREL developed courses, Alaska History and English, were pilot tested in seven rural sites. Two more courses, Developmental Reading and General Math, were then developed by NWREL in 1980. All four of these IST courses were pilot tested in 29 rural sites during the 1980-1981 school year.

THE IST PROGRAM

The IST courses have been developed to address the specific needs of rural Alaskan students. They utilize a unique individualized instructional design which includes the teacher, traditional texts and printed materials, microcomputer assisted/managed instruction, and audio cassette tapes. The teacher manages the integrated use of the three media components which provide the primary instruction in each lesson of the IST courses. For example, in an Alaska History lesson introducing students to the geography of Alaska, the students: a) listen to a dramatic episode on an audio cassette tape which primarily

introduces geographic terms; b) perform a computer activity composed of multiple choice questions which review the terminology previously introduced in the audio cassette tape; c) read a passage entitled "Geography of Alaska: Introduction" which presents general information about the geography of Alaska; and d) perform another computer activity composed of multiple choice and fill-in the blank questions which review the general information previously presented in the reading passage.

Although used in an integrated fashion, each media component serves specific purposes. The traditional texts and printed materials include published textbooks, texts adopted from correspondence courses, reading selections, worksheet exercises, and projects. The texts and readings are intended to be the primary sources of information for the students; the worksheets and projects are intended for drill of concepts and their application.

The microcomputer instruction includes activities which introduce vocabulary, develop map skills, and drill essential facts, concepts, and concept applications. Review and test activities are also included in the microcomputer instruction. The test scores are recorded and stored on student computer disks which can be accessed by teachers for grading purposes. The microcomputer also provides immediate feedback to the students indicating the correctness of their responses, and the correct answers if incorrect ones had been given.

The audio cassette tapes include lectures, dramatic episodes, teacher-student dialogues, narrations, and interviews. They are intended to introduce and reinforce skills and concepts, to supplement information presented in the printed materials, to guide students through reading and

written work, and to repeat in aural form information which students might have difficulty reading. In addition, several tapes are accompanied by worksheets called Listening Guides. This format provides students the opportunity to confirm in writing their understanding of the concept being taught and to receive immediate feedback on, and explanation of, correct responses.

The teacher is an essential element of the IST program. The teacher's time is actively spent in managing and facilitating student learning through such activities as a) providing one-on-one and group instruction, b) monitoring student progress, c) maintaining records of student performance, d) providing constructive feedback to students by correcting their IST written work, and e) managing the use of the microcomputer. These tasks are somewhat different from the more traditional teacher tasks of a) planning the course structure, b) developing and organizing the course materials and activities, and c) presenting the subject matter to the students. The teachers, therefore, who supervise IST courses are able to give more personal attention to specific instructional needs of students and devote more time to other important responsibilities at their school.



THE IST COURSES

The four IST courses used in the pilot test are intended as full-year courses at the ninth and tenth grade level. They were developed around printed materials such as correspondence courses or published texts. The courses include computerized drills and tests, audio cassette tape activities, printed materials, diagnostic placement tests, individual student progress charts, and complete teacher's guides with answer keys.

The Alaska History course was based on an Alaska Centralized Correspondence Study course. It has no one text, but a number of books, brochures, and other references are utilized. This course consists of five units: I. Alaskan Geography, II. Alaska's Native Groups, III. Russian Exploration - History to 1867, IV. American Purchase to Statehood - 1867 to 1959, and V. Alaska's Resources. Its purpose is to prepare Alaska's students for active citizenship by teaching Alaska's geography, history, and issues affecting its future.

The English course was based on a high school English course developed by the Alaska Centralized Correspondence Study unit in DOE. No one text is used in this course, but paperback books of short stories and novels are required reading. This course consists of twelve units. The first six units stress grammar and usage, the second six units stress literature and writing. The course goals are: a) to teach correct sentence structure, punctuation, capitalization, and spelling; b) to improve students' ability to organize thoughts into written sentences and paragraphs; c) to give students an appreciation of short stories, novels, and poetry; and d) to give practice at everyday skills such as filling out forms, writing letters, and requesting library books.

The Developmental Reading course was developed around the Scott, Foresman Basics in Reading, Book 7, text entitled With the Works. This course consists of 36 lessons divided into four sections. The initial two sections emphasize characterization, vocabulary building through structure and context, fact vs. opinion, using a dictionary and an encyclopedia, types of fiction, story elements, charts and tables, non-fiction organization, figures of speech and idiom, and elements of style. The final two sections emphasize evaluating sources of information, bias and connotation, summarizing and classifying, outlines, propaganda, choice of words, analogy, skimming and reviewing, drawing conclusions, graphs, outlining from notes, and types of literature. The purposes of this course are: a) to increase the ability of the students to comprehend the meaning of word phrases, sentences, paragraphs, and entire selections; b) to increase the ability of students to study effectively; and c) to instill in students a greater appreciation of literature by broadening their background experience.

The General Math course was developed around the Silver Burdett text, General Mathematics Skills and Applications. This course consists of nine chapters: I. Whole Numbers, II. Adding and Subtracting with Decimals, III. Multiplying and Dividing with Decimals, IV. Fractions, V. Measurement, VI. Ratio and Proportion, VII. Percent, VIII. Geometry, and IX. Statistics and Probability. The course stresses mastery of computation skills with integers, fractions, decimals, ratios, and percentages, and practical applications of these in present day living and work situations.

THE EVALUATION DESIGN

Educational Skills Development, Inc. (ESD) of Lexington, Kentucky conducted an evaluation of the 1980-1981 pilot testing of the IST program under contract to DOE. In this evaluation the effectiveness of the IST program was assumed to depend upon a variety of factors. In addition to course quality, training, and implementation, such factors as cultural values, social and environmental contexts, local facilities, community perspectives, students' characteristics, and teachers' attitudes were studied. Thus the goal of the evaluation was more than to simply determine whether IST "worked", but also to provide explanations for the degree of effectiveness achieved by the program, and recommendations for changing or improving it. Based on this goal, the evaluation was designed to determine how the characteristics of the student, teacher, setting, and courseware combine to influence student performance. In addition, concerns about the costs of implementing the IST program in the 1980-1981 pilot testing were addressed. Data for the evaluation included pre-course and post-course tests, monthly student progress reports, site visit reports submitted by regional supervisors and members of the evaluation team, Alaska Statewide Assessment Test (ASAT) scores, student and teacher personality inventories, student and teacher attitude surveys, teacher training evaluation reports, course design analyses, and student microcomputer performance results. Data from this variety of sources permitted a more complete analysis of the IST program.

WHERE WERE THE IST COURSES PILOT TESTED?

Twenty-five schools (304 students) provided data for the 1980-1981 IST evaluation. These schools, all of which volunteered to participate in the pilot testing, constituted a cross section of the rural Alaskan schools for which IST is intended. Participating sites typically purchased the needed microcomputer equipment, paid for teacher travel to training sessions, and agreed to provide data required for the evaluation of the courses. The pilot test sites represented a wide

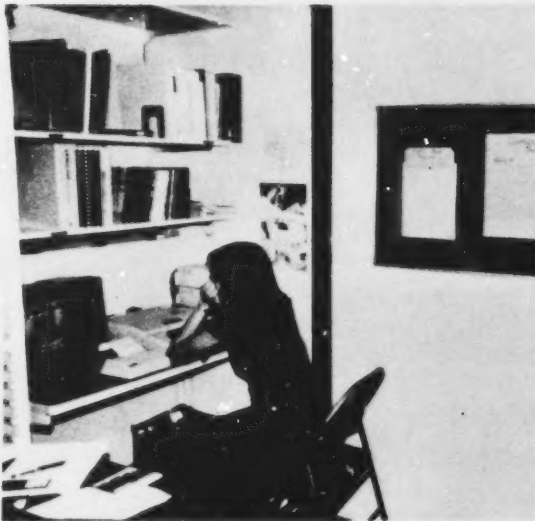
range of rural settings in which the IST courses were implemented. As indicated in Table 1, the pilot test schools were located throughout the State of Alaska. A typical school was located in a rural community with a population of less than 300 people. Most schools in the pilot testing were Regional Education Attendance Area (REAA) schools, and the typical student-to-teacher ratio was 11 to 1. A local power company typically provided the electric power to the schools and most school children had parents who had not completed high school.

TABLE 1
IST PILOT TEST SITE CHARACTERISTICS
(NUMBER OF SITES = 25)

		PERCENT	
SITE LOCATION:	Southeastern Region	24	
	Southcentral Region	44	
	Northern Region	32	
TYPE OF SCHOOL:	REAA	64	
	Borough	36	
TYPICAL EDUCATIONAL LEVEL OF PARENTS:	Both parents completed high school	28	
	Only one parent completed high school	20	
	Neither parent completed high school	52	
POWER SOURCE:	Local Power Company	50	
	Gas or Diesel Generator	33	
	Both of these sources	17	
	<u>MEDIAN</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>
Community Population:	255	93	950
Number of Students in School:	50	7	189
Number of Teachers at School:	3	1	20
Student-Teacher Ratio:	11:1	4:1	21:1

HOW RELIABLE WAS THE MICROCOMPUTER EQUIPMENT?

Relatively few serious problems were reported during the 1980-1981 pilot testing. Class time lost due to microcomputer hardware problems averaged about two days per month per site. Considering the environmental conditions and prior experience of personnel at the sites, the microcomputer equipment performed exceptionally well. The breakdown of equipment, therefore, is a relatively minor concern in the future implementation and effectiveness of the IST program.



An IST student working on a microcomputer activity in a rural Alaskan school.

WHAT WERE THE IST TEACHERS LIKE?

Thirty-nine teachers participated in the IST pilot testing. As shown in Table 2 these teachers usually supervised one or two IST courses, with an enrollment of about 5 to 7 students per course. The teachers averaged five years teaching experience. They typically had a bachelor's degree in Social Studies or Education. Also, most teachers felt their prior experiences had prepared them to perform two important functions of an IST teacher: 1) the maintenance of student performance records, and 2) the management of student learning in a setting where several different activities are occurring simultaneously in the classroom. The majority of the teachers, however, had no prior experience in the classroom use of audio cassette tapes or computers.

An analysis of the relationship between teacher characteristics and student performance was conducted in the evaluation of the pilot testing. Student performance was found to be significantly better in the IST courses supervised by teachers who felt their prior experience had prepared them to manage student learning when several different activities are occurring simultaneously in the classroom and to use audio tapes in the classroom. Other teacher characteristics, such as years teaching experience, academic degree, academic area of specialization, familiarity with instructional computer programming, and prior experience in the classroom use of computers, generally were not significantly related to student performance.

TABLE 2
IST PILOT TEST TEACHER CHARACTERISTICS
(NUMBER OF TEACHERS = 39)

		PERCENT	
Number of IST Courses Supervised:	One	36	
	Two	31	
	Three	11	
	Four	22	
Highest Degree Received:	High School	6	
	Bachelor's	64	
	Master's or Doctorate	30	
Major Area of Study:	Social Studies	28	
	Education	24	
	Language/English	14	
	Biology	14	
	Mathematics	7	
	Social Science	7	
	Administration	7	
Prior Education Training and Experience in:	Classroom use of:		
	Audio Cassette Tapes	48	
	Computers	30	
	Maintaining Student Records of performance	73	
	Managing student learning when several activities are occurring simultaneously in the classroom	85	
	Writing computer programs for instruction	12	
	<u>MEDIAN</u>	<u>MINIMUM</u>	<u>MAXIMUM</u>
Years Teaching Experience:	5	1	18

WHAT TYPE OF SPECIAL TRAINING AND ASSISTANCE DID THE IST TEACHERS RECEIVE?

Most IST teachers attended a three-day pre-service training workshop prior to beginning the IST courses in their schools. In this workshop the teachers were introduced to the IST program, its courseware, media components, and procedures. The teacher guides were presented and discussed, and each teacher had "hands-on" experience with the first few lessons in each course. The teachers practiced the setting-up, operation, and management of the microcomputer, as well as procedures for preventing and solving microcomputer problems. In addition, the roles and responsibilities of the teacher in the IST program were covered.

A midyear meeting for IST teachers was held in January, 1981 in Anchorage. This two-day meeting brought the teachers together to share their IST experiences with other teachers and with the representatives of the Alaska Department of Education. Successful strategies and problem areas concerning implementation of the IST courses were identified and discussed, with solutions recommended. Additional "hands-on" IST training and demonstrations were provided.

In addition to the two meetings, each pilot test site was visited twice by IST support staff from DOE. The initial visit (of two to three days) occurred early in the school year and served the purpose of assisting with the implementation of IST in the classroom. The primary purposes of the second site visit were to observe the operation of the IST courses in the schools and to assist teachers with any problems they were having.

The training and assistance received by IST supervising teachers was found to be essential to the successful introduction and implementation of the IST courses. No teacher considered the training received to be so basic that it was not worthwhile, but neither did any teacher consider the amount of training required to operate the IST courses to be too much. Fifty-three percent of the teachers considered the amount of training to be reasonable but demanding; 47 percent considered it to be easily accomplished.

Teacher training and assistance will be more efficient and cost-effective in the future. As a result of the experience gained by DOE during the pilot testing, initial training sessions are now conducted by DOE at several relatively small regional meetings rather than one large statewide meeting and a telecommunications network has been set up through which teachers can contact other teachers or DOE representatives for assistance with IST problems. Additionally, improved teacher guides are now available which include helpful hints from experienced IST teachers.



IST students completing a written course assignment.

HOW DID THE TEACHERS IMPLEMENT THE IST COURSES AT THEIR SCHOOLS?

Classroom Management - The IST program allows for some flexibility in classroom management procedures. No single classroom management model seemed to be most effective. IST students in smaller schools usually worked on IST courses in the same classroom as other students working in non-IST courses. Such a classroom was often divided into areas serving distinct functions. One area was designed for group instruction, another area for individualized study, and a third area for placement of materials and equipment. The teacher typically stored all IST materials and equipment, and the students typically worked with the microcomputer and listened to the audio cassette tapes in the third area. The individualized reading and written work required of the IST students was completed in the area set aside for individualized study.

IST students in the larger schools were usually set apart from other students working in non-IST courses. In some of these schools a single classroom was designated as the IST room. All IST course activities, including computer work, were conducted in this room, and all IST materials and equipment were located here. Non-IST activities occurred in the IST room at times during the school day, but never simultaneously with IST activities. In other large schools IST courses were conducted in several classrooms during specified periods in the school day. The IST materials were located in each of the classrooms. The IST equipment, particularly the microcomputer and its associated materials, was located and used in a central location such as a library or learning resource center.

Teacher Supervision - The best model for teacher supervision of the

IST courses was to have the teacher in the same classroom as the students. Having a teacher available to provide IST students with assistance when needed was an important factor in the successful implementation of the courses. The students, however, did not need constant supervision. Most teachers attended to other responsibilities, such as assisting non-IST students, correcting written work/tests, and record-keeping, while they were supervising the IST students.

Use of Aides - Implementation of the IST courses did not necessarily increase the need for aides at the 1980-1981 pilot test sites. The use of aides in assisting IST supervising teachers was dependent upon the situation at each school and did not seem to significantly impact on the successful implementation of the IST courses. Typically, aides were used at schools to assist teachers in managing IST and non-IST classroom activities, in maintaining records of student performance, and in supervising microcomputer operations where the computer was located in an area outside the classroom in which other IST activities occurred.

Use of Microcomputer - Most teachers developed some system to specify the order in which students were to use the microcomputer. Although the systems typically resulted in some students not having access to a computer at the very moment they were ready to use it, rarely did students have to waste time while waiting their turn. The flexibility in the structure of the IST courses usually permitted students to work on other IST activities while they waited. The most efficient student-to-computer ratio was found to be about six IST students per computer per class period. This ratio maximized computer use during a typical class period and minimized the waiting time

experienced by students.

The location of the microcomputer in the schools somewhat influenced its effectiveness. The computer was most effective when it was located in an isolated area in the same classroom in which the students performed their other IST activities. In this location the computer was easily accessible to the students, the teacher was readily available to assist the students, and the distractions near the computer were minimal. Locating the computer in this location was not possible at some schools due to local conditions. Most schools in which the computer had to be located outside the classroom had aides available to assist students using it. Some schools that offered several IST courses and scheduled them in several different classrooms attempted to locate their computer in the "most effective" area by moving it from room to room as needed during the school day. Although few computer malfunctions were actually experienced during the 1980-1981 pilot testing, the constant movement of the computer equipment increased the likelihood of malfunctions.

Storage of IST Materials - A comprehensive set of materials comes with each IST course. The complete IST Alaska History course, for example, has five large loose-leaf-like teacher guides, five student manuals for each student, cassette tapes, selected reading materials, and computer diskettes. The manner in which these materials were organized affected their accessibility to the students. Accessibility was greatly enhanced by placing the materials presently being used by the students in an organized manner on easily accessible bookshelves and storing the rest of the materials out of the way, in a secure, dry, and cool place until needed by a student.

WHAT WERE THE TEACHERS' ATTITUDES TOWARDS IST?

Table 3 indicates that nearly 75 percent of the teachers considered the IST courses to be well-designed for their classrooms. Also, more than 66 percent viewed the amount of work required to manage and operate the IST courses as generally less than that required when using traditional courses; the other teachers viewed the IST courses as requiring a reasonable amount of work. No teacher considered the courses to be "too much work" or "not worth the bother".

Table 3 also indicates that most teachers reported a preference for using the whole courses, rather than parts of them. All teachers who would prefer to use parts reported that they would like to use the computerized instruction and IST workbooks and exercises. The teachers generally felt that the microcomputer activities and textbooks were the components of the IST courses most compatible with their teaching styles. Audio cassette tapes and projects were considered the least compatible. The computer activities were viewed by the teachers as the most interesting component of the courses for the students, while the supplemental activities were viewed as the least interesting. Overall, the data suggested that the supervising teachers were generally very satisfied with the design and usefulness of the IST courses.

TABLE 3

PILOT TEST TEACHERS' ATTITUDES TOWARDS IST

(NUMBER OF TEACHERS = 39)

	PERCENT OF TEACHERS IN AGREEMENT
The IST courses are well designed to be used and managed in a classroom like mine.	74
Amount of work required of an IST teacher:	
a) too much	0
b) more than a traditional course	35
c) less than a traditional course	65
d) not worth the bother	0
I would prefer to use the whole IST courses as they now exist.	59
Of those teachers who would prefer to use only parts of the IST courses, the parts they preferred to use were:	
a) computerized instruction	100
b) IST workbook and exercises	100
c) audio cassette tapes	57
d) published materials	43
e) outside readings	7
IST components compatible with teaching styles:	
MOST COMPATIBLE	Computer Exercises
LEAST COMPATIBLE	Audio Cassette Tapes
IST components producing the greatest interest for students as viewed by the teachers:	
MOST INTERESTING	Computer Exercises
LEAST INTERESTING	Supplementary Activities

WHAT WERE THE IST PILOT TEST STUDENTS LIKE?

A total of 304 students enrolled in one or more of the IST courses during the 1980-1981 pilot test. As indicated in Table 4, these students were mostly Eskimo, with the Aleut, Tlingit, and Athabascan native groups also represented. The typical students enrolled in the English, Developmental Reading, and General Math courses were 15 or 16 year old,

ninth grade males. The typical student enrolled in the Alaska History course was a 17 year old, eleventh grade male. The general academic ability of the IST students who participated in the 1980-1981 pilot testing, prior to their enrollment in the IST courses, was typical of rural Alaskan ninth and tenth grade students (as measured by the Alaska Statewide Assessment Test - ASAT). The ASAT results are summarized in Table 5.

TABLE 4

IST PILOT TEST STUDENT CHARACTERISTICS

	ALL COURSES	ALASKA HISTORY	ENGLISH	DEVELOPMENTAL READING	GENERAL MATH
Number of Students	304	75	59	117	116
Age: Median	16	17	15	16	16
Minimum	10	14	13	10	12
Maximum	20	20	20	20	19
Grade Level: Median	9	11	9	9	9
Minimum	5	6	8	5	7
Maximum	12	12	12	12	12

PERCENT

Native Group Affiliation:

Eskimo	58
Aleut	16
Tlingit	11
Athabascan	10
Non-Native	5
Gender: Male	64
Female	36

TABLE 5
ALASKA STATEWIDE ASSESSMENT TEST (ASAT) RESULTS

NUMBER OF STUDENTS	NUMBER OF ITEMS	ASAT MEAN SCORES (% CORRECT)		
		ASAT 1979 STANDARDIZATION GROUP		
		ALL STUDENTS	RURAL STUDENTS	IST STUDENTS
		1440	158	296
MATH COMPUTATION	36	64	42	50
MATH APPLICATION	66	61	44	50
READING COMPREHENSION	45	67	42	53
READING WORD IDENTIFICATION	39	74	62	72



A typical IST classroom setting in a small rural Alaskan school showing the location of each IST component of instruction: the printed materials (on which the students are working at their desks), the microcomputer, the audio cassette tape equipment, and the teacher.

WHAT PORTION OF AN IST COURSE
WILL A TYPICAL STUDENT COMPLETE
IN AN ACADEMIC YEAR?

The typical English, Developmental Reading, and General Math students progressed through their courses in the sequence established in the design of the courses. The typical Alaska History student, however, skipped Unit II (Alaska's Native Groups) because most supervising teachers felt its content would be more appropriately presented after Unit IV.

As indicated in Table 6, the typical student could be expected to complete three of the five units in the Alaska History course, 10 of the 12 units in the English course, 30 of

the 36 lessons in the Developmental Reading course, and 43 of the 92 lessons in the General Math course. These data suggest that: a) the faster students could complete the entire English and Developmental Reading courses, and most students could complete approximately 83 percent of these courses in one academic year; b) most students could be expected to complete the Alaska History course in one and one-half academic years; and c) most students would need two academic years to complete the General Math course. These projections are based on the progress reported by students who participated in the 1980-1981 pilot testing, with an effective academic year considered as 170-175 school days.

TABLE 6
IST COURSE COMPLETION INFORMATION

IST COURSE	TOTAL COURSE	PORTION EXPECTED TO BE COMPLETED IN ONE ACADEMIC YEAR	% OF TOTAL COURSE EXPECTED TO BE COMPLETED IN ONE YEAR
ALASKA HISTORY	5 Units	Units I, III, IV	64
ENGLISH	12 Units	Units I thru X	83
DEVELOPMENTAL READING	36 Lessons	Lessons 1 thru 30	83
GENERAL MATH	92 Lessons	Lessons 1 thru 43	47

WHAT WERE THE STUDENTS ATTITUDES TOWARDS IST?

Table 7 indicates that nearly all students considered the microcomputer exercises interesting; about 59 percent found the reading and written components of the IST courses interesting; and 49 percent considered the audio cassette tapes interesting. The audio cassette tapes were the only IST media component considered boring by a significant percent of the students. Most students reported the difficulty level of the courses to be "about right" for them. Also, half of the

students indicated they almost always understood what needed to be done and could work by themselves on their courses; no students indicated they rarely or never knew what to do and almost always had to get help from their teacher. These data suggest that: a) most students find learning using the IST media components of instruction an interesting experience and b) the instructions and procedures in the IST courses are sufficient for most students to have confidence in their ability to progress through the courses on their own.

TABLE 7

PILOT TEST STUDENT ATTITUDES TOWARDS IST

(NUMBER OF STUDENTS = 49)

	PERCENT
The Computer exercises in the IST courses are:	
(a) interesting	92
(b) of little interest	8
(c) boring	0
The audio cassette tapes in the IST courses are:	
(a) interesting	49
(b) of little interest	24
(c) boring	27
The reading and written work in the IST courses are:	
(a) interesting	59
(b) of little interest	35
(c) boring	6
Clarity of IST course instructions and need for teacher assistance:	
(a) almost always understand what needs to be done and can work by myself	50
(b) sometimes do not understand what needs to be done and need my teacher's help	50
(c) rarely or never know what needs to be done and must get my teacher's help	0
IST course difficulty:	
(a) easy	22
(b) about right	73
(c) difficult	5

HOW MUCH DID THE STUDENTS LEARN?

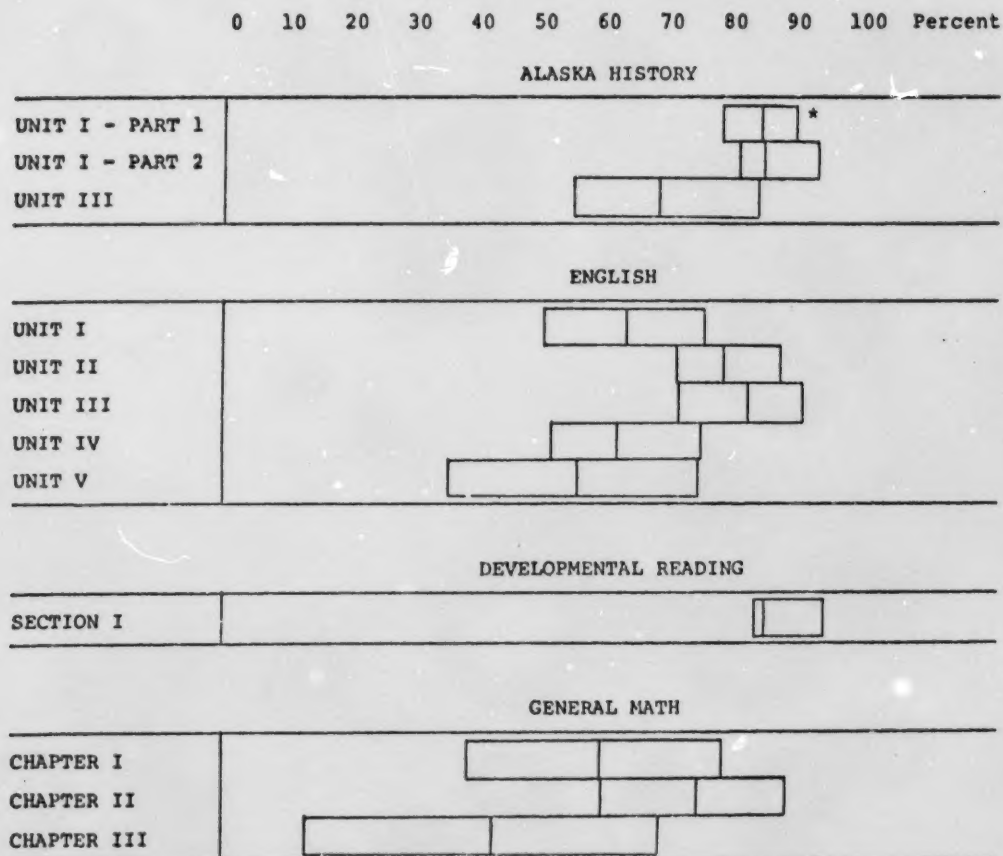
Student learning in the IST courses was assessed using unit, section, and chapter computer tests and post-course paper-and-pencil tests.

Computer Tests - As indicated in Figure 1, the mean performance of

students was at least 60 percent on all computer tests completed by at least 25 students, except Unit V in the English course and Chapter III in the General Math course. The students performed at an 85 percent mastery level on the Alaska History Unit I - Parts 1 and 2 and Developmental Reading Section I computer tests.

FIGURE 1

COMPUTER TEST PERFORMANCE RESULTS



* The bar represents the range of scores for the middle 50 percent of students. The dark line within the bar represents the mean score for all students.

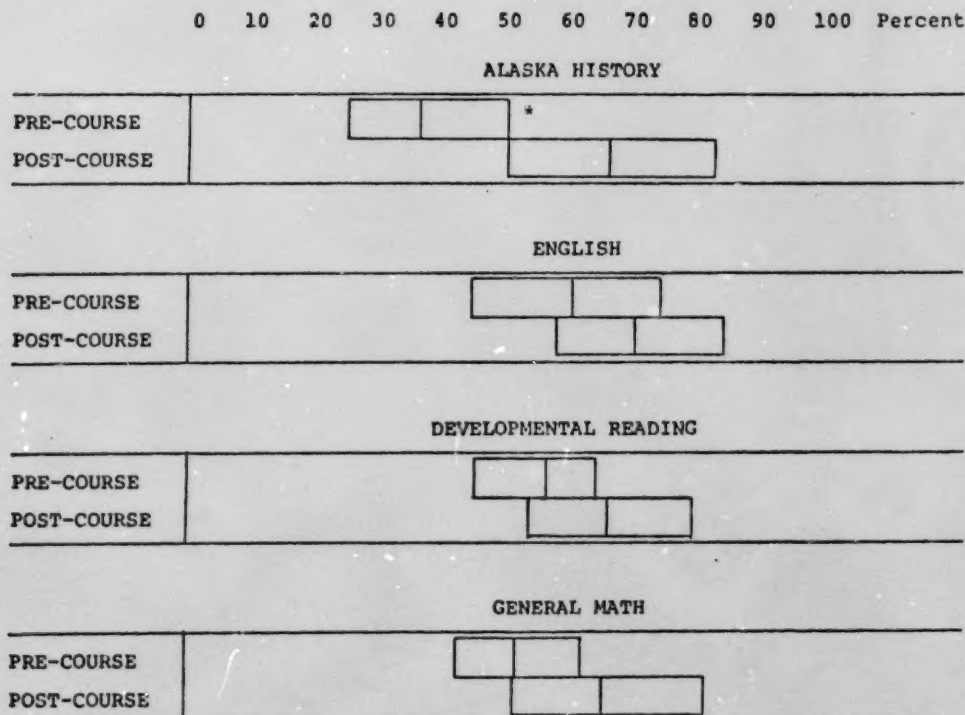
Post-course Tests - The students' pre-course and post-course knowledge of course content was measured by paper-and-pencil tests. The students' test scores were based only on those items related to the portions of the courses they completed. However, items on the Developmental Reading test were not related to any particular portion of the course, thus students' test scores were based on all questions on this test. As indicated in Figure 2, the students, on the average, were generally unfamiliar with the content of the Alaska History course, and somewhat familiar with the content of the English, Developmental Reading, and General Math courses prior to their enrollment in these courses. At the end of the school year, the

mean test scores increased to between 60 percent and 70 percent in all four courses.

The most significant factor in overall student performance in all four IST courses was the students' prior knowledge of the course content. After taking into consideration this pre-course knowledge, students' pre-course math and reading skills (as measured by the subtests of the Alaska Statewide Assessment Test) were also significantly related to student performance in all four courses. Student age and grade level did not significantly relate to student performance in any of the IST courses.

FIGURE 2

PRE-COURSE AND POST-COURSE TEST PERFORMANCE RESULTS



* The bar represents the range of scores for the middle 50 percent of students. The dark line within the bar represents the mean score for all students.

WHAT ARE THE COSTS FOR THE IST COURSES?

As shown in Table 8, the total cost per-student in the 1980-1981 pilot testing averaged \$1620 for each complete course. The per-student cost to the Alaska Department of Education made up the majority of the total costs, averaging \$1470 per course. The average per-student cost to the sites was \$150 per course. These costs include all print, audio cassette tapes, and microcomputer materials and equipment.

Most of the DOE per-student costs in the 1980-1981 pilot testing were for course development. These are one-time costs, thus as the number of students using the IST courses increases the per-student costs to

DOE substantially decreases, while the per-student costs to the sites increases minimally. An example of the effect on costs as enrollment in the courses increases is also presented in Table 8. The DOE per-student cost estimates, based on six students per course at each of 100 sites, reduce to an average of \$207 per course while the average site per-student cost estimates increase to only \$209 per course. DOE costs should continue to decline. The costs to sites, however, will probably rise somewhat due to inflationary increases in costs for equipment and printing. The teacher training costs to sites will likely decrease in the future, however, due to more efficient training procedures and a reduction in the number of teachers needing training.

TABLE 8

PER-STUDENT COSTS FOR EACH COMPLETE IST COURSE

(Based on 1980-1981 costs)

COURSE	NUMBER ENROLLED	COST TO DOE*	COST TO SITE	TOTALS
COST FOR 1980-1981 ENROLLEES				
ALASKA HISTORY	75	1,751	202	1,953
ENGLISH	59	2,027	130	2,157
DEVELOPMENTAL READING	117	1,047	141	1,188
GENERAL MATH	116	1,056	127	1,183
COST ESTIMATES FOR 100 SITES WITH 6 STUDENTS PER SITE				
ALASKA HISTORY	600	219	259	478
ENGLISH	600	199	182	382
DEVELOPMENTAL READING	600	204	201	405
GENERAL MATH	600	204	195	399

* Alaska Department of Education

Using the 1980-1981 pilot test costs, the costs of offering the IST courses can be compared with offering similar courses taught by teachers qualified to teach in the appropriate secondary level content areas and using the IST print materials. Conservatively, the hiring of 20 additional teachers would have been necessary to offer similar courses to the 1980-1981 pilot test students, if the IST courses were not available. Taking into consideration the costs for 20 additional teachers, offering the complete IST courses was nearly one-half the cost of offering similar courses with just the print materials and the additional teachers. This estimate cannot be applied to any particular site since some sites would not require additional teachers, while others would need two or more. However, the overall reduction in costs from implementation of the IST courses would probably be real at most sites.

WHAT CAN BE CONCLUDED ABOUT THE IST PROGRAM?

Major conclusions drawn from the evaluation of the 1980-1981 pilot testing of the IST program are:

1. The IST courses can be successfully implemented in settings quite different from each other, comprised of students with different cultural backgrounds, and staffed by professionals who differ in educational background, training, and philosophy.
2. The microcomputer equipment is very reliable considering the relative lack of computer expertise of the teachers and students using the equipment, and the environmental conditions under which it was used in the pilot test.
3. The IST program is quite versatile. The courses can effectively be adapted to serve several different functions in a school and can be successfully implemented in several different ways.
4. Teachers are important to the successful implementation of the IST courses. They are needed to oversee student progress and provide assistance when needed. Teachers, however, need not provide constant supervision to the IST students. They can typically engage in other activities, such as assisting non-IST students or record-keeping, during an IST class period.
5. Some special training and assistance is needed for teachers to supervise the IST courses. The required training and assistance, however, is not considered excessive, with teachers able to successfully implement the IST courses after a single three-day workshop and a personal visit by a supervisor early in the school year.
6. The teachers generally reported a positive attitude toward the IST courses. No teacher considered the courses "too much work" or "not worth the bother".
7. Each of the four IST courses constitutes more than one full academic year of instruction for most students, although very fast students may finish within one year. On the average, about 83 percent of the English and Developmental Reading courses could be completed in one academic year, while 64 percent of the Alaska History course and 47 percent of the General Math course could typically be completed in one year.

8. The IST students generally reported a positive attitude towards the IST courses, particularly the microcomputer component of instruction.
9. The IST students showed significant gains in performance on the concepts and skills studied in the courses.
10. The total per-student cost of developing and implementing the IST courses in the 1980-1981 pilot testing was about one-half the cost of offering comparable courses taught by teachers certified in the course content areas. This imbalance in per-student cost will grow even larger in the future as more students use the IST program.
11. Although not directly evaluated, a reasonable assumption is that, not only are the teachers and students directly involved in the IST courses benefiting from their use, but non-IST students are also benefiting from the added personal attention the teachers are able to provide them.

WHAT IS THE FUTURE OF THE IST PROGRAM?

The pilot testing of the IST courses has demonstrated the efficacy of the IST approach to secondary education in Alaska. Currently about 90 rural Alaskan schools are using at least one of the four pilot tested IST courses. It is expected that the number of schools will increase to more than 100 during the 1982-1983 school year.

In addition to the four pilot tested courses, two full-year IST

courses, General Science and U.S. History, have been developed and are being pilot tested during the 1981-1982 school year in about 10 rural Alaskan schools. The General Science course was developed around the Holt text, General Science. It consists of five units: I. Matter, Atoms, and Chemical Changes; II. How Does Energy Affect Matter?; III. How Do We Make and Use Energy?; IV. How Is Our Planet Changing?; and V. What Makes Up Our Living World?. The aims of this course are to help students: a) understand the basic principles and vocabulary of science; and b) learn the basic ideas and scientific discoveries that explain many everyday occurrences.

The U.S. History course was developed around the Scott, Foresman text, America! America!. It consists of 13 units: the first five units cover U.S. History from the first American through 1850; the last eight units cover the period immediately preceding the Civil War through the 1970's. The aim of this course is to help students learn about America's past, present, and future by studying the events, issues, and people of the past.

Besides the six full-year IST courses currently available, two one-semester courses, Consumer Education and Health Education, are now being developed. They are expected to be available for the 1982-1983 school year. Both courses will be developed in a stand-alone modular format. The primary focus of the Consumer Education course is the development of a variety of skills and attitudes for successful management of personal and financial resources. The Health Education course will stress the inter-relationship of physical, emotional, and environmental health.